March 4, 2004
Tornadoes and Widespread Severe Winds

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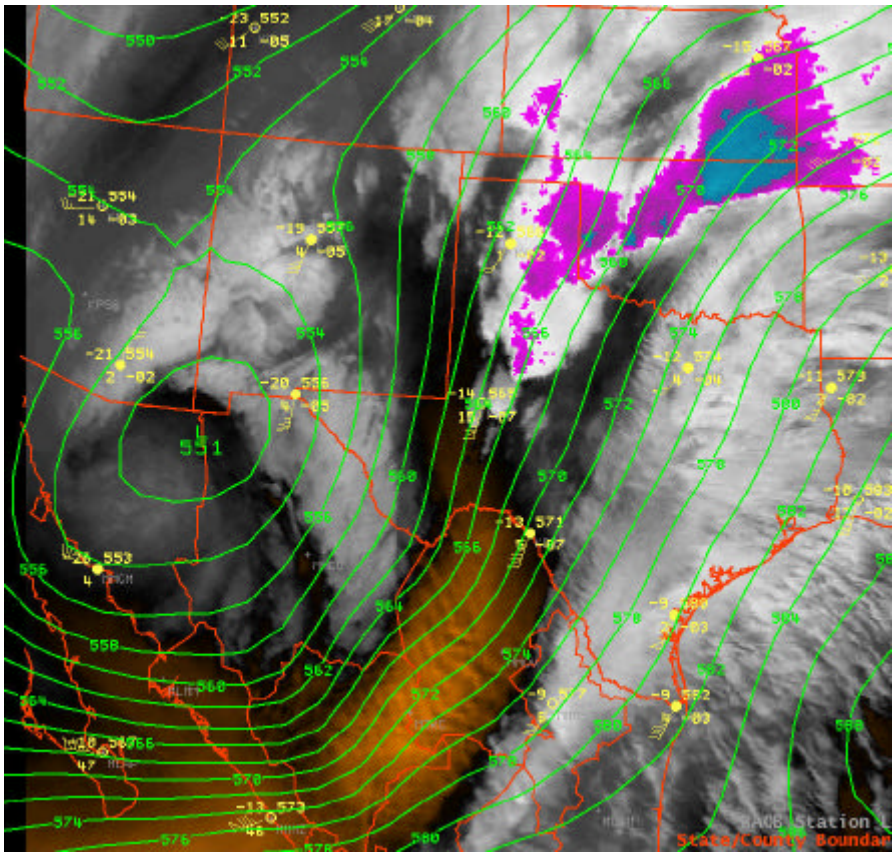
Figure 1. Damage from a tornado in the Lake Stamford area.

During the morning and early afternoon of March 4, 2004 an intense line of severe and tornadic thunderstorms moved across West Central Texas. These storms packed hurricane force winds of 80 mph or more as they raced at over 60 mph across the area. We at the National Weather Service office in San Angelo issued Tornado Warnings for 12 counties and Severe Thunderstorm Warnings for 19 counties across our County Warning Area between 9:45 am and 12:30 pm. Every county in our area of responsibility was under a warning at some time during the 2 hours and 45 minutes that the squall line moved across the area. We received numerous reports of wind damage including roofs blown off houses, large trees blown down, and many mobile homes damaged. Several tornadoes were embedded in some of these storms along with the strong winds, which caused even more damage to some communities. Although most areas of West Central Texas saw some damage from the storms, the hardest hit communities included the Lake Sweetwater area, Lake Stamford area, Hamlin, Carlsbad, Wingate, Tuscola, Clyde, Coleman and Moran. West Central Texas will need several weeks, and even months to clean up and rebuild from these storms.

On the morning of March 4, a strong upper level low pressure system moved eastward into far west Texas. Figure 2 shows a composite map of the 500 mb Eta model height field initialization at 12 Zulu (6:00 am CST) with a water vapor satellite image for the same time. Thunderstorms had developed overnight over west Texas near Midland, and had moved little during the night.



<u>Figure 2.</u> Eta model 500 mb height initialization at 12Z (6 am) on March 4 with water vapor satellite image. You can see the swirl in the clouds around the low pressure center over northern Mexico. Notice the color enhanced clouds over west Texas showing thunderstorms from north of Midland to near Amarillo.

At the surface, a low pressure center had formed over southwest Texas near the Big Bend, with a warm front extending northward from Fort Stockton to Sweetwater to Wichita Falls (See Figure 3 on the next page). Temperatures and dewpoints reached the 60s to the south of the warm front with strong southeast winds. To the north of the front, temperatures and dewpoints were in the 40s with winds out of the northeast. As the center of the upper low moved into west Texas that morning, the atmosphere became increasingly unstable to the south of the front. The Storm Prediction Center first issued a tornado watch for West Central Texas at 4:25 am. They replaced this watch with a new tornado watch at

9:45 am. This new watch headlined the particularly dangerous situation that was unfolding as the atmosphere continued to destabilize.

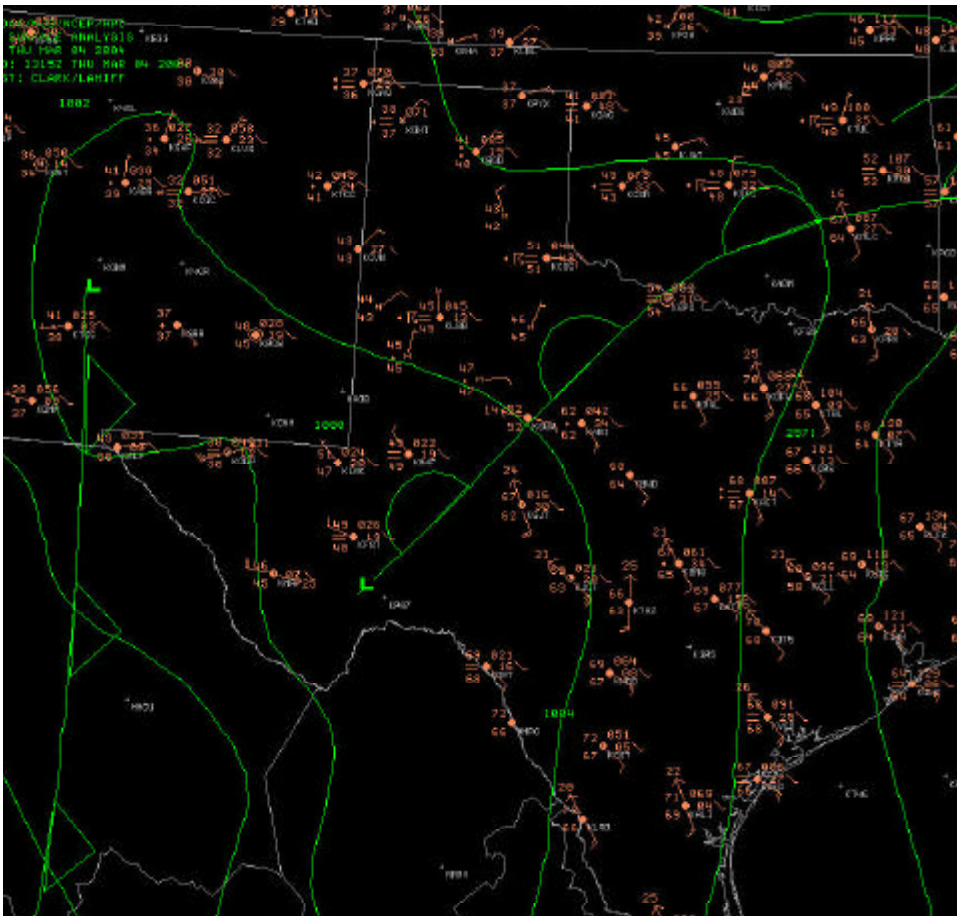


Figure 3. Surface chart at 6:00 am showing a low pressure area near the Big Bend of southwest Texas with a warm front from Ft. Stockton to Sweetwater to Wichita Falls.

By 10 am, temperatures warmed to near 70 across West Central Texas, with surface-based convective available potential energy (CAPE) values exceeding 1000 J/Kg (Figure 4), indicating a potential for strong thunderstorm updrafts. A line of strong thunderstorms developed along the warm front, and these storms started to quickly push eastward. By 10:30 am, these storms moved across Sterling, Irion and Crockett counties, producing wind damage in Sterling City and Ozona. Figure 5 shows the line of thunderstorms at 10:30 am, about 10 minutes before the first tornado developed. The first tornado, an F0 (up to 72 mph) on the Fujita scale, hit the community of Carlsbad in northwest Tom Green County just northwest of San Angelo and damaged 8 mobile homes. The city of San Angelo was spared from the brunt of the storms, with only minor damage reported in the city. Several rotating supercell thunderstorms quickly developed by 11 am along the northern and central areas of the squall line.

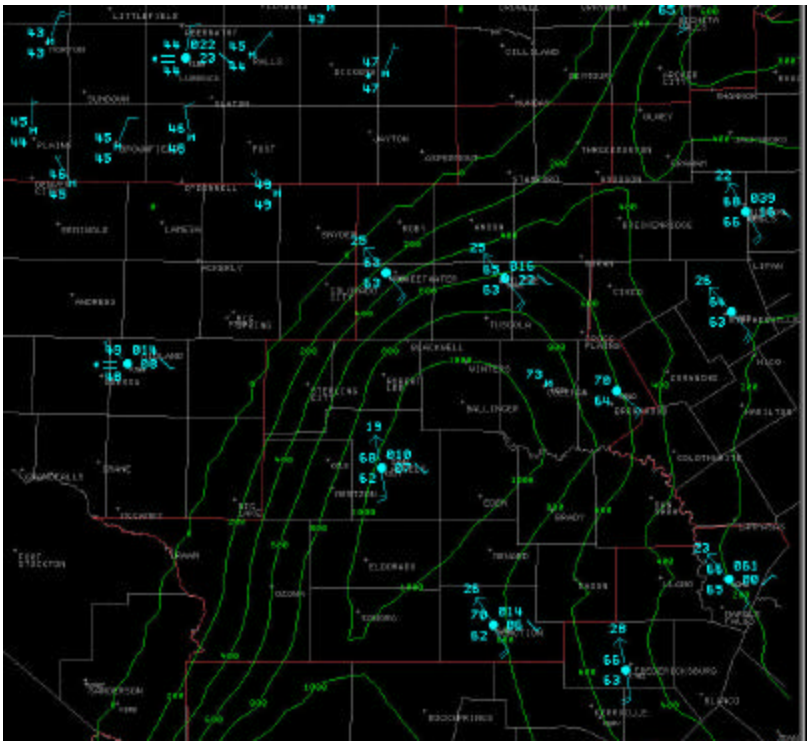


Figure 4. Surface map at 10 am showing temperatures climbing to near 70 across West Central Texas. Convective Potential Energy (CAPE, green lines) values had climbed to over 1000 J/kg, indicating the potential for strong thunderstorm updrafts.

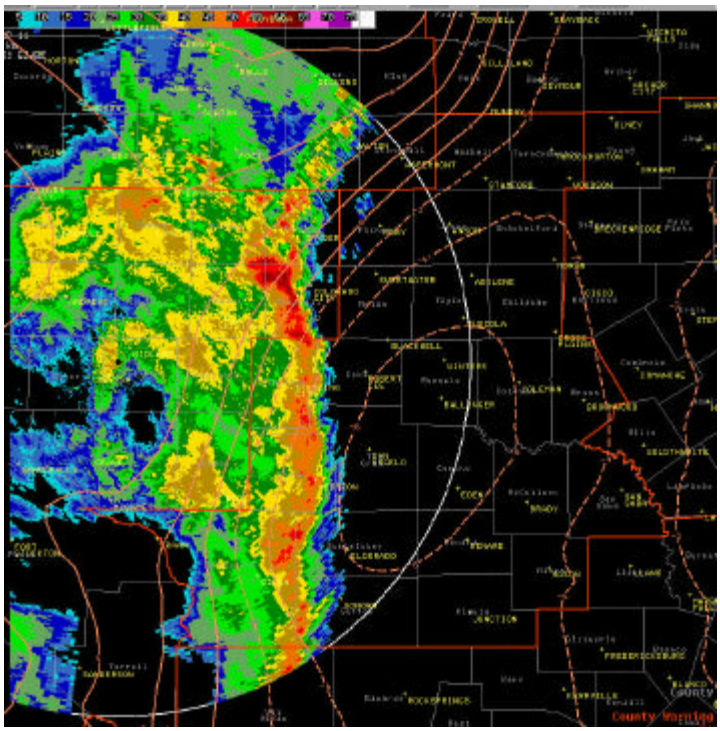


Figure 5. A line of severe thunderstorms at 10:30 am moving toward San Angelo and Sweetwater. The dashed orange lines show the lifted index, a measure of instability, with very unstable values of -6 across West Central Texas.

Figure 6 shows a radar image of a tornadic storm as it approached Lake Sweetwater just southeast of the city of Sweetwater at 11 am. An F1 tornado (73-112 mph) moved across the Lake Sweetwater area, damaging the roofs of several homes and knocking down several trees. Notice the hook-shaped signature on the radar just south of Sweetwater near the lake. At the same time, severe thunderstorms across Coke County to the south caused roof damage in Bronte. Between 11:00 am and 11:15 am, the National Weather Service received damage reports due to strong winds and tornadoes from 8 different counties as the storms picked up speed and raced across west central Texas at more than 60 mph.

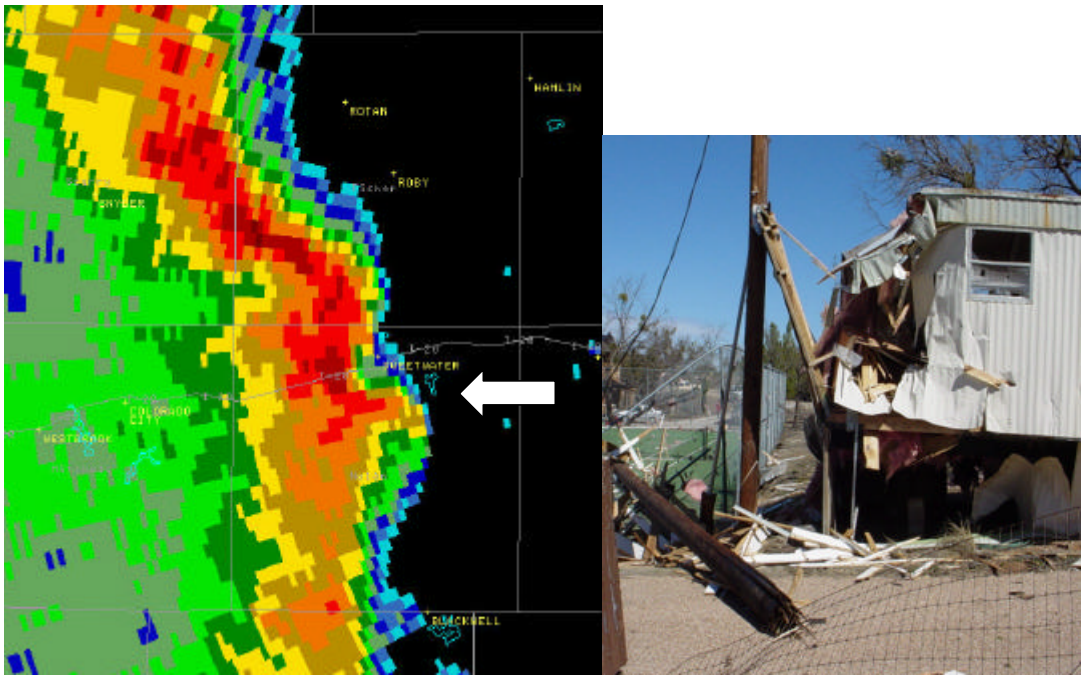


Figure 6. Left - KDYX (Dyess AFB) Doppler Radar reflectivity image at 11:01 am showing a tornadic storm moving toward Lake Sweetwater (white arrow). Other severe storms were about to hit Roby and Rotan to the north with 70 to 80 mph winds. Right - Damage to home at Lake Sweetwater.

By 11:15 am, tornadic storms approached Taylor and Jones counties near Abilene. Wingate in Runnels County was hit by a severe downburst of wind with at least 80 mph winds. These hurricane force winds produced a damage path more than 3 miles wide with uprooted trees and roof damage in the town. A tornado may have also been embedded in these stronger winds. This particular storm continued to strengthen and moved into Taylor County and produced a weak F0 tornado near Bradshaw. The worst was yet to come as this storm approached Tuscola. An F1 tornado in Tuscola (Figure 7) damaged the Jim Ned High School and a church, and blew over several tractor-trailers. This storm also produced an F0 tornado in Potosi, which knocked down a 400-foot radio tower and damaged a barn. An eyewitness saw a funnel cloud over Potosi. At the same time, a downburst over Hamlin in Jones County to the north produced widespread damage to trees and roofs throughout the community.

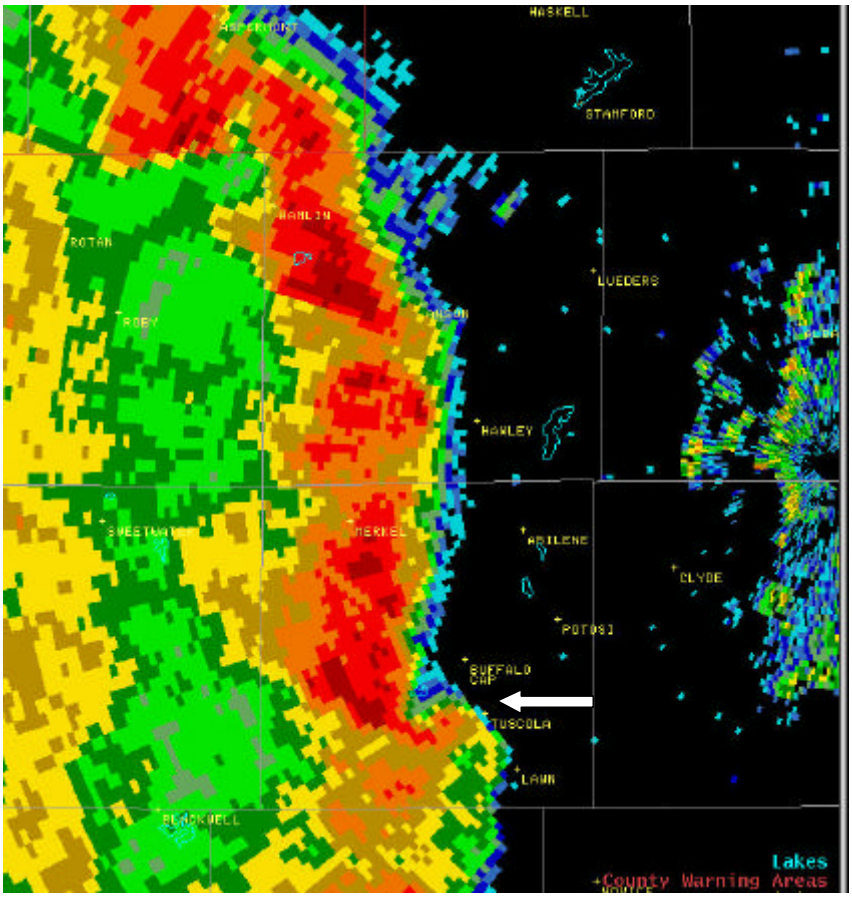


Figure 7. Radar image at 11:36 am of a tornadic storm as it approaches Jim Ned High School and Tuscola south of Abilene. Also notice the severe storms to the north in Jones County across Hamlin.

Figure 8. Wind damage from downbursts at Wingate in Runnels County (left) and Hamlin in northwest Jones County (right). (Wingate photo courtesy of Snuffy Smith, NWS Cooperative Observer in Wingate)

By noon, the storms continued to race across West Central Texas, reaching Haskell County and Shackelford County. The worst tornado of the day, an F2 tornado (113 – 157 mph winds) struck the community around Lake Stamford with devastating winds. About 32 homes were damaged and 2 homes were destroyed around the lake. Figure 9 shows this storm from both the KDYX and KSJT radars. Notice how much easier you can see the hook shape on the storm from the KDYX radar. These supercell tornadic storms were low-topped, meaning they did not have updrafts that extended high into the atmosphere. As the storms moved further away from the radar, the radar beam was shooting over the top of the strongest parts of the storms, making them more difficult to see through the wider radar beam from more distant radars.

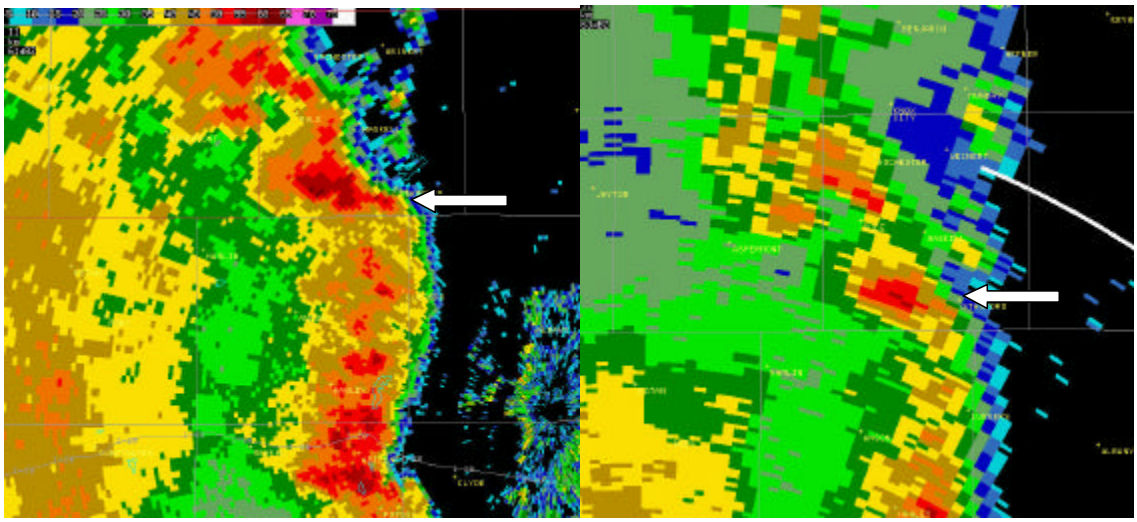


Figure 9. Radar images around 12:02 pm of the tornadic storm at lake Stamford (white arrow). The left image is from KDYX radar (Moran) and the right image is from KSJT radar (San Angelo).

Figure 10. Two photos of damage from the Lake Stamford area. The home shown in the right photo was flipped over and the roof is now sitting on the foundation.

The storm that produced the tornado in Tuscola passed just south of Abilene and moved into Callahan County. In Clyde, a couple of water tanks were blown about a mile away from their original location. Another F0 tornado hit west of Moran in southern Shackelford county. Moran sustained considerable damage from downburst winds south of the tornado as the storm passed through.

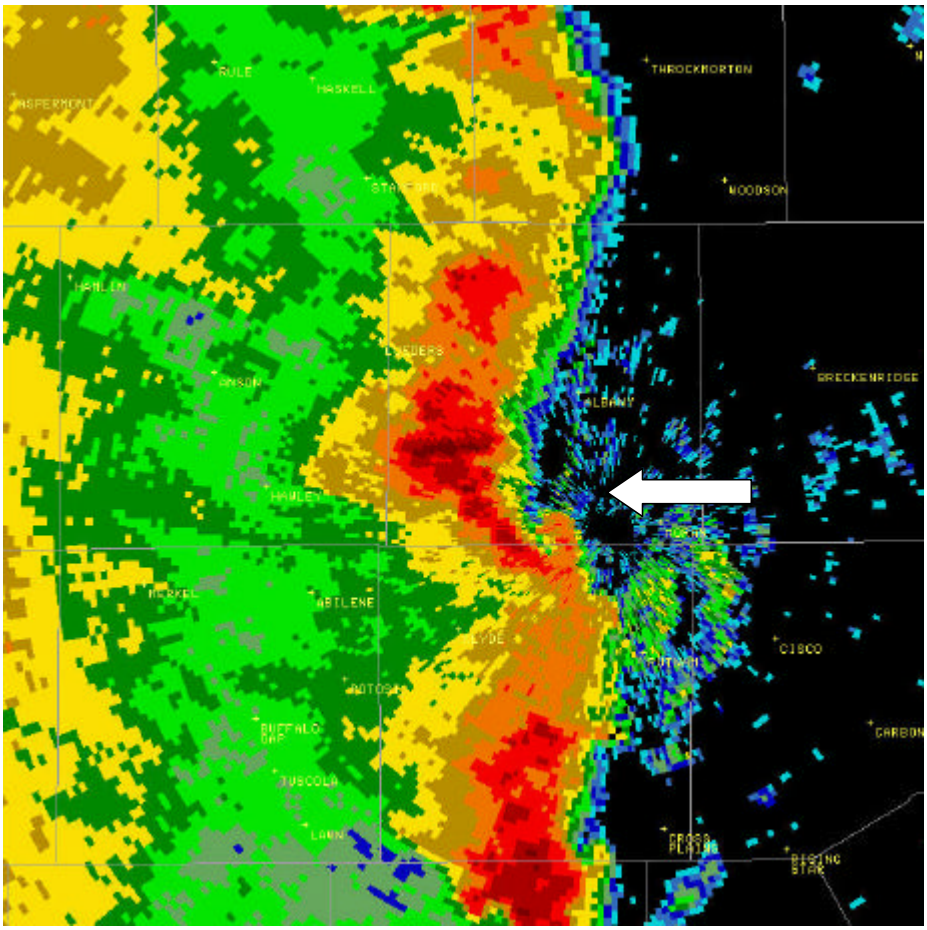


Figure 11. Tornadic thunderstorm approaching the KDYX radar site in Moran. Widespread wind damage occurred over Moran.

Between 12:30pm and 1:00 pm, six additional counties across West Central Texas reported wind damage as the line of storms pushed eastward out of the area (Figure 12 next page). Damage occurred mainly to storage sheds, power poles, camper trailers and trees across many areas including Mason, Brownwood, Throckmorton, Coleman and Menard. All 24 counties across the San Angelo Weather Forecast Office's County Warning Area sustained some wind damage from these storms. The storms continued to produce tornadoes and wind damage across central and east Texas as the storm system moved through the state. At this time, the cost of the damage from these storms is not known.

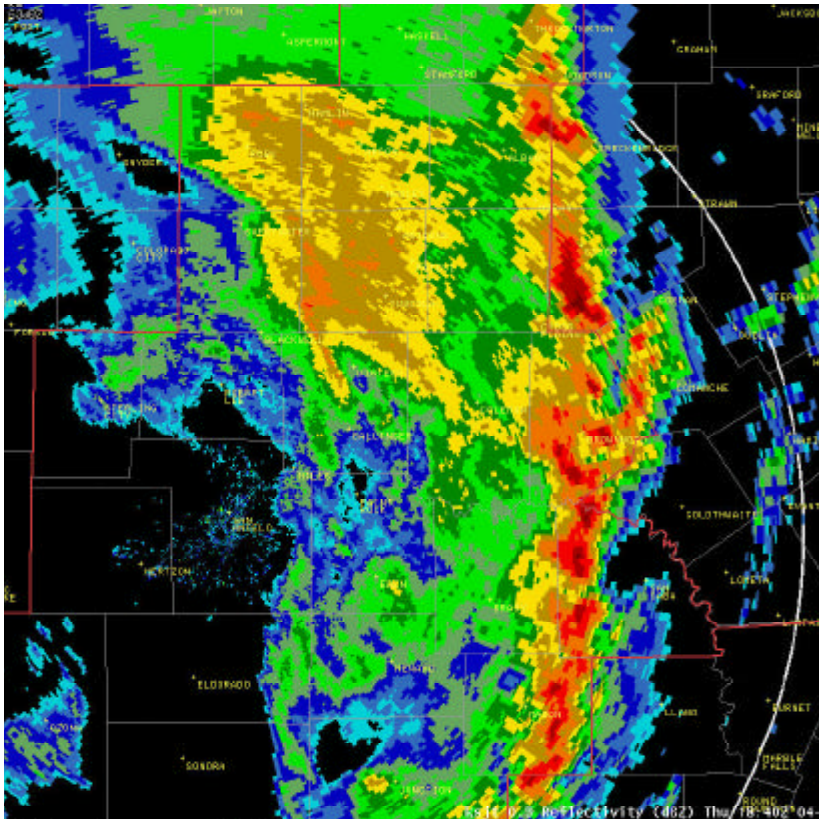


Figure 12. KSJT radar image of the squall line over Brown, San Saba and Mason counties at 12:45 pm moving eastward into central Texas.